

## Geological Resources

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### Introduction

National Forest management activities, including development of geologic resources, can result in ecosystem damage when the activity's location, design, construction or implementation is not based on an understanding of geologic conditions and geomorphic processes.

Geological resources affect all aspects of National Forest System lands. Geological resources include cave management, paleontological resources, geological special interest areas and ground water management. Geological hazards can impact public safety on National Forest System (NFS) lands. Hazards can include rock falls, debris flows, slope stability issues and public health concerns.

Geology determines watershed morphology, soils types and other essential functions for NFS lands. Ground water is a valuable resource that may be affected by project planning. Mining and minerals management is included in the management of National Forest System lands could be affected by the proposed project.

Mining related hazards are a concern for public safety as the National Forests have potentially dangerous abandoned mine shafts and hazardous products in the areas of the proposed action.

The proposed action could potentially impact geological resources. Geologic and mining related hazards could be impacted which could result in a threat to public health and safety.

### Analysis Framework: Statute, Regulation, Forest Plan and Other Direction

The following statutory authorities govern geologic resources and services activities essential to Forest Service programs:

- 1. Watershed Protection and Flood Prevention Act of August 4, 1954, as Amended (68 Stat. 666; 16 U.S.C. 1001). (FSM 2501.1.)** This act authorizes the Secretary of Agriculture to share costs with other agencies in recreational development, ground-water recharge and water-quality management, as well as the conservation and proper use of land.
- 2. Federal Water Pollution Control Act of July 9, 1956, as Amended (33 U.S.C. 1151) (FSM 2501.1); Federal Water Pollution Control Act Amendments of 1972 (86 Stat. 816) (FSM 2501.1) and Clean Water Act of 1977 (91 Stat. 1566; 33 U.S.C. 1251). (FSM 2501.1, 7440.1.)** These acts are intended to enhance the quality and value of the water resource and to establish a National policy for the prevention, control and abatement of water pollution. Ground water information, including that concerning recharge and discharge areas and information on geologic conditions that affect ground water quality are needed to carry out purposes of these acts.
- 3. National Forest Roads and Trails Systems Act of October 13, 1964 (78 Stat. 1089; 16 U.S.C. 532-538). (FSM 7701.1.)** This act provides for the construction and maintenance of an adequate system of roads and trails to meet the demands for timber, recreation and other uses. It further provides that protection, development and management of lands will be under the principles of multiple use and sustained yield of product and services (16 U.S.C. 532). Geologic conditions influence the final selection of route locations.
- 4. National Environmental Policy Act of January 1, 1970 (NEPA) (83 Stat. 852 as Amended; 42 U.S.C. 4321, 4331-4335, 4341-4347). (FSM 1950.2.)** This act directs all agencies of the Federal Government to utilize a systematic interdisciplinary approach which will ensure the

integrated use of the natural and social sciences in planning and in decision making which may have an impact on man's environment. Geology is one of the applicable sciences.

**5. Mining and Minerals Policy Act of December 31, 1970 (84 Stat. 1876; 30 U.S.C. 21a).** This act provides for the study and development of methods for the disposal, control and reclamation of mineral waste products and the reclamation of mined lands. This requires an evaluation of geology as it relates to ground water protection and geologic stability.

**6. Forest and Rangeland Renewable Resources Planning Act of August 17, 1974 (RPA) (88 Stat. 476; 16 U.S.C. 1600-1614) as Amended by National Forest Management Act of October 22, 1976 (90 Stat. 2949; 16 U.S.C. 1609). (FSM 1920 and FSM 2550.)** This act requires consideration of the geologic environment through the identification of hazardous conditions and the prevention of irreversible damages. The Secretary of Agriculture is required, in the development and maintenance of land management plans, to use a systematic interdisciplinary approach to achieve integrated consideration of physical, biological, economic and other sciences.

**7. Surface Mining Control and Reclamation Act of August 3, 1977 (SMCRA) (30 U.S.C. 1201, 1202, 1211, 1221-43, 1251-79, 1281, 1291, 1309, 1311-16, 1321-28).** This act enables agencies to take action to prevent water pollution from current mining activities and also promote reclamation of mined areas left without adequate reclamation prior to this act.

**8. Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (CERCLA) (94 Stat. 2767; 42 U.S.C. 9601, et seq).** This act provides authority to the Environmental Protection Agency and to other Federal agencies, including the United States Department of Agriculture, to respond to release of hazardous substances, pollutants and constituents. It also provides for joint and several liability to potentially responsible parties (PRPs) for cleanup costs of existing water contamination. See also FSM 2160.

**9. Federal Cave Resources Protection Act of 1988 (102 Stat. 4546; 16 U.S.C. 4301 et seq).** This act provides that Federal lands be managed to protect and maintain, to the extent practical, significant caves.

**10. FSM-2880.12 - Executive Orders.** The following Executive Orders provide direction for geologic resources and services activities on National Forest System lands:

**Executive Order 12113, Independent Water Project Review, January 5, 1979.** This Executive Order requires an independent water project review by the Water Resources Council on preauthorization reports and preconstruction plans for Federal and Federally assisted water and related land resource plans. The technical review will evaluate each plan for compliance with the Council's principles and standards, agency procedures, other Federal laws and goals for public involvement.

**11. Forest Plan (LRMP) Soils Standards and Guidelines for General Forest.** The SNF LRMP identifies three areas as Special Interest Areas for geological resources. There are: Kings Cavern Geological Area (388 acres), Courtright Intrusive Contact Zone and Geological Area (11 acres) and Dinkey Creek Roof Pendant Geological Area (640 acres).

## Methodology

The geologic assessment conducted for the Travel Management Project included potential hazards from abandoned mine lands (AML), potential hazards from Natural Occurring Asbestos (NOA), potential hazards from landslides, potential impacts to ground water and ground water dependent ecosystems and potential impacts from OHV use in Geologic Special Interest Areas.

## Abandoned Mine Lands

Assessment for hazards associated with abandoned mine lands (AML) was conducted at the forest scale using two databases and GIS. A database of unauthorized routes was analyzed for proximity to AML sites in two public databases; see “Data Sources” for more information. Four categories of distance were used: routes intersecting AML sites, routes within a 200 foot radius, routes greater than 200 ft to and less than 0.25 mile radius and routes greater than 0.25 mi. and less than 0.50 mile radius to AML sites in the database.

### *Assumptions*

1. Significant mining operations appear in at least one of the databases used in this assessment. Mining operation sites not included in one of these databases were not considered. Unmarked sites may exist in the forest.
2. Where a precise location is recorded in the source documentation for a mine site, that location is reported in the MRDS (Schweitzer 2009).

### *Data Sources*

1. TOMS (Topographically Occurring Map Symbols) database, available from California Department of Conservation. The TOMS database is an inventory of mining features located on USGS 7.5 minutes topographic quadrangles.
2. MRDS (Mineral Resource Data System) database, available from the United States Geological Survey (USGS).

## Natural Occurring Asbestos (NOA)

Natural occurring asbestos (NOA) was evaluated and is documented in the air quality section of the EIS. See air quality section for further discussion of NOA.

## Landslide Hazards

Landslide hazards were evaluated and determined not to be a concern for potential impacts to the general public. Field review and assessment identified one route (SR21za) with slope stability concerns. The slope failure of this route is analyzed in the soils and watershed section of this DEIS and is adequately mitigated. Landslide hazards will not be addressed any further in the geology section of this DEIS.

## Ground Water and Ground Water Dependent Ecosystems

The presence and use of motor vehicle routes was determined not to be a concern to ground water and not to be in any violation of SNF LRMP direction. Potential impacts to ground water dependent ecosystems, such as meadows and springs were assessed and addressed in the aquatics and water section of the EIS. See aquatics and water sections for further discussion on ground water dependent ecosystems.

## Geologic Special Interest Areas

The SNF has three Geologic Special Interest Areas, including the Kings River Geological Area, the Dinkey Creek Roof Pendant Geological Area and the Courtright Intrusive Zone Geologic Area. Unauthorized routes are not located within the Kings River Geological Area and the Courtright Intrusive Zone Geologic Area. Unauthorized routes KD-248, KD-249 and KD-250 are located in the Dinkey Creek Roof Pendant Geological Area. These unauthorized routes are included only in Alternative 1 and are currently being used. It is unknown if these routes are

causing resource damage. There has been reported damage in the Courtright Intrusive Zone Geologic Area by unauthorized motor vehicle use. Barriers have been installed in attempt to dissuade OHV users to stay out of this area. In summary, the Alternatives 2, 3, 4, 5 will have no effect to Geologic Special Interest Areas on the SNF. Geologic Special Interest Areas will not be addressed any further.

## Affected Environment – Abandoned Mine Lands

Table 92 summarizes the number of routes and areas contributing to AML accessibility and exposure by alternative and distance.

**Table 92. Summary of Routes Contributing to AML Accessibility and Exposure**

	Alt 1		Alt 2		Alt 3		Alt4		Alt 5	
Distance	Unauthorized Routes	Use Areas	Proposed Routes	Use Areas	Proposed Routes	Use Areas	Proposed Routes	Use Areas	Proposed Routes	Use Areas
Intersect	2	0	0	0	0	0	0	0	0	0
200 ft	16	0	1	0	0	0	0	0	1	0
0.25 mi	157	0	11	0	0	0	1	0	5	0
0.5 mi	437	0	22	0	0	0	2	1	13	1

## Environmental Consequences-Abandoned Mine Lands

### Alternative 1

#### Direct and Indirect Effects

##### *Continued Cross-country Travel*

The direct effect of cross-country motorized travel is that 660,000 acres of SNF lands are open to exposure and accessibility to AML sites and associated hazards. There are 612 inventoried unauthorized routes within half mile of known AML sites. Table 93 summarizes this data for Alternative 1.

**Table 93. Alternative 1 – Routes by Distance and Database**

Distance	Unique Routes	Use Areas	AML Database	Number of Routes	Number of Mines
Intersect	2	0			
			INTER TOMS poly	2	1
200 feet	16	0			
			200 MRDS	5	4
			200 TOMS POINT	11	8
			200 TOMS POLY	2	1
>200ft. - <0.25 mi	157	0			
			QM MRDS	119	50
			QM TOMS POINT	84	37
			QM TOMS POLY	3	1
>0.25mi - <0.5 mi	437	0			
			HM MRDS	479	111
			HM TOMSPOINT	243	75
			HM TOMSPOLY	14	3

### *Addition of Facilities*

No facilities are proposed to be added to the NFTS in this alternative, there are no direct or indirect effects of this action.

### *Effects of the Existing NFTS*

There are no changes to the NFTS in Alternative 1, therefore there are no direct or indirect effects.

### **Cumulative Effects**

Alternative 1 would have the greatest potential for causing adverse cumulative effects to public safety because when added to the past, present and reasonably foreseeable actions, the probable proliferation of motorized access to lands adjacent to AML sites on the SNF would increase accessibility to these hazards. There will be 612 unauthorized routes within 0.5 miles of AML, which could be accessed by off-highway vehicle users.

## **Alternative 2**

### **Direct and Indirect Effects**

#### *Prohibition of Cross-country Travel*

The direct effect would be beneficial to public safety because prohibition of motorized cross county travel would restrict public accessibility and exposure to AML sites. SNF visitors would be unable to use motor vehicles to purposefully search for AML sites. The indirect effect of prohibiting cross-country motorized travel is decreased accidental exposure of AML sites. Accidental exposure could occur from a user following an abandoned access trail to a mine site.

### *Addition of Facilities*

Compared to Alternative 1 the direct and indirect effects of adding facilities are decreased access and exposure to AML sites and associated hazards such as unstable adits and shafts with collapse potential, drop-offs, pits, contaminated tailings and trapped gas. Alternative 2 has 34 proposed routes within 1/2 mile from a known AML (Table 94).

**Table 94. Alternative 2 – Routes by Distance and Database**

Distance	Unique Routes	Use Areas	AML Database	Number of Routes	Number of Mines
Intersect	0	0			
			INTER TOMS poly	0	0
200 feet	1	0			
			200 MRDS	1	1
			200 TOMS POINT	0	0
			200 TOMS POLY	0	0
>200ft. - <0.25 mi	11	0			
			QM MRDS	9	9
			QM TOMS POINT	2	2
			QM TOMS POLY	0	0
>0.25mi - <0.5 mi	22	0			
			HM MRDS	18	20
			HM TOMSPOINT	4	5
			HM TOMSPOLY	0	0

### *Changes to the Existing NFTS*

Changes of vehicle class and season of use for the existing NFTS are not expected to have a direct or indirect effect on public safety due to exposure to AML sites.

### **Cumulative Effects**

Cumulative effects include direct and indirect effects under the prohibition action, adding facilities and changing facilities. These effects will be added to the current effects from the NFTS. The addition of trails to the existing NFTS will increase accessibility and exposure to AML sites. Access to AML within 200 feet of authorized trails under this alternative will be mitigated (see Appendix A for a summary of route specific mitigations and the project record). However, there will be 34 authorized trails within 0.5 miles of AML, which could be within walking distance of users of Off-highway Vehicles. See Table 95 for summary information of the number of routes contributing to AML accessibility and exposure by alternative and distance.

## Alternative 3

### Direct and Indirect Effects

#### *Prohibition of Cross-country Travel*

The direct effect would be beneficial to public safety because prohibition of motorized cross county travel would restrict public accessibility and exposure to AML sites. Forest visitors would be unable to use motor vehicles to purposefully search for AML sites. The indirect effect of prohibiting cross-country motorized travel is decreased accidental exposure of AML sites. Accidental exposure could occur from a user following an abandoned access trail to a mine site.

#### *Addition of Facilities*

No facilities are proposed to be added to the NFTS in alternative, there are no direct or indirect effects of this action.

#### *Changes to the Existing NFTS*

There are no changes to the NFTS in Alternative 3, therefore there are no direct or indirect effects.

### Cumulative Effects

When added to the past, present and reasonably foreseeable actions, it is unlikely there would be a measurable cumulative effect from the actions proposed in Alternative 3.

## Alternative 4

### Direct and Indirect Effects

#### *Prohibition of Cross-country Travel*

The direct effect would be beneficial to public safety because prohibition of motorized cross county travel would restrict public accessibility and exposure to AML sites. SNF visitors would be unable to use motor vehicles to purposefully search for AML sites. The indirect effect of prohibiting cross-country motorized travel is decreased accidental exposure of AML sites. Accidental exposure could occur from a user following an abandoned access trail to a mine site.

#### *Addition of Facilities*

Compared to Alternative 1 the direct effects of adding facilities are decreased access and exposure to AML sites and associated hazards such as unstable adits and shafts with collapse potential, drop-offs, pits, contaminated tailings and trapped gas. Alternative 4 has three proposed routes and one proposed use area within 1/2 mile from a known AML sites (Table 95).

**Table 95. Alternative 4 – Routes by Distance and Database**

Distance	Unique Routes	Use Areas	AML Database	Number of Routes	Number of Mines
Intersect	0	0	INTER TOMS poly	0	0
200 feet	0	0	200 MRDS 200 TOMS POINT 200 TOMS POLY	0 0 0	0 0 0
>200ft. -<0.25 mi	1	0	QM MRDS QM TOMS POINT  QM TOMS POLY	0 1  0	0 1  0
>0.25mi - <0.5 mi	2	1	HM MRDS HM TOMSPOINT  HM TOMSPOLY	1 1  0	1 1  0

### *Changes to the Existing NFTS*

Changes of vehicle class and season of use for the existing NFTS are not expected to have a direct or indirect effect on public safety due to exposure to AML sites.

### **Cumulative Effects**

Cumulative effects includes direct and indirect effects under the prohibition action, adding facilities and changing facilities. These effects will be added to the current effects from the NFTS. The addition of trails to the existing NFTS will increase accessibility and exposure to AML sites. Access to AML within 200 feet of authorized trails under this alternative will be mitigated (see Appendix A for route specific mitigation). However, there will be three authorized trails and one use area within 0.5 miles of AML, which could be within walking distance of users of off-highway vehicles. See Table 92 for summary information of the number of routes contributing to AML accessibility and exposure by alternative and distance.

## **Alternative 5**

### **Direct and Indirect Effects**

#### *Prohibition of Cross-country Travel*

The direct effect would be beneficial to public safety because prohibition of motorized cross country travel would restrict public accessibility and exposure to AML sites. SNF visitors would be unable to use motor vehicles to purposefully search for AML sites. The indirect effect of prohibiting cross-country motorized travel is decreased accidental exposure of AML sites. Accidental exposure could occur from a user following an abandoned access trail to a mine site.



### *Addition of Facilities*

Compared to Alternative 1 the direct effects of adding facilities are decreased access and exposure to AML sites and associated hazards such as unstable adits and shafts with collapse potential, drop-offs, pits, contaminated tailings and trapped gas. Alternative 5 has 19 proposed routes and 1 proposed use area within 1/2 mile from known AML sites (Table 96).

**Table 96. Alternative 5 – Routes by Distance and Database**

Distance	Unique Routes	Use Areas	AML Database	Number of Routes	Number of Mines
Intersect	0	0			
			INTER TOMS poly	0	0
200 feet	1	0			
			200 MRDS	1	1
			200 TOMS POINT	0	0
			200 TOMS POLY	0	0
>200ft. - <0.25 mi	5	0			
			QM MRDS	4	3
			QM TOMS POINT	1	1
			QM TOMS POLY	0	0
>0.25mi - <0.5 mi	13	1			
			HM MRDS	13	4
			HM TOMSPOINT	1	1
			HM TOMSPOLY	0	0

### *Changes to the Existing NFTS*

Changes of vehicle class and season of use for the existing NFTS are not expected to have a direct or indirect effect on public safety due to exposure to AML sites.

### **Cumulative Effects**

Cumulative effects includes direct and indirect effects under the prohibition action, adding facilities and changing facilities. These effects will be added to the current effects from the NFTS. The addition of trails to the existing NFTS will increase accessibility and exposure to AML sites. Access to AML within 200 feet of authorized trails under this alternative will be mitigated (see Appendix A for a summary of route specific mitigations and the project record). However, there will be 19 authorized trails and 1 use area within 0.5 miles of AML, which could be within walking distance of users of motor vehicles. See Table 92 for summary information of the number of routes contributing to AML accessibility and exposure by alternative and distance.